

# WORLD'S GREATEST EFFORT TO SOLVE CITY TRANSPORTATION PROBLEM

The New York Subway the  
Greatest Thing of Its Kind  
Ever Undertaken.

NO OTHER COMPARES WITH IT

What It Is Expected to Do in  
Solving the Most Difficult City  
Transportation Problem.

By Bassett Staines.

(Special to The Times-Dispatch.)  
NEW YORK, Oct. 8.—There are greater engineering works going on in the world today. For example, the construction of the Aswan dam and the other irrigation works on the Nile, which, as their creator, Sir William Garstin, proudly boasts, will live in the use and observation of mankind long after the ancient monuments of the Egyptians have disappeared beneath the sands of the Nubian desert. But of its kind the New York subway is the greatest thing yet done, and it is also the greatest engineering enterprise of any kind in the United States to-day.

It will be carried throughout nearly the whole of its length in the course of the present month, if strikes do not further delay the completion of the work. It is practically finished from the residential districts away uptown to the great business section around City Hall. Some work is still going on farther downtown towards the Battery, and also at the northern extremity of Manhattan and on the Brooklyn extension.

Will Exceed All Others.

Time was when the Gothard and Mont Cenis tunnels were held to be considerable feats in the earth. They were mere rabbit burrows in comparison with the vast shaft which has been driven longitudinally through the island of Manhattan.

Or take, instead, the greatest excavations made by vanished civilizations. "Great as are the caves of Elephanta and the temples of Karnak and of Aboosimbel on the Nile bank, the floor space of the stations of the New York subway, taken together, is greater than that of any two of them, and when the Brooklyn and under-the-river tunnels to be made are completed, such stations will exceed in combined space all the rock-hewn temples of the ancient world known to archaeology."

This is the statement of an engineer connected with the work who happens to be gifted with a poetic imagination. But none the less he possesses that precision of detail which properly belongs to his profession, for he has computed that the earth which has been or will be excavated in the making of the subway amounts to exactly 1,700,283 cubic yards. The rock tunneled amounts to half a million yards; the rock excavated, to more than double that quantity.

Some Striking Figures.

Here are some other figures which speak for themselves as to the magnitude of the work:

Steel used in the structure, 75,000 tons; cast iron, a mere trifle of 10,000 tons; concrete, far over 500,000 cubic yards; water proofing, more than 75,000 cubic yards of brick, 2,000 cubic yards of vault lights, over 5,000, each shedding its beams for a radius of many yards; total length of track approaches, about 330,000 feet. These figures do not include the great Brooklyn extension, by way of the Battery tunnel, which is already under way; or other schemes for the extension of the subway service, either mooted or in active process of execution.

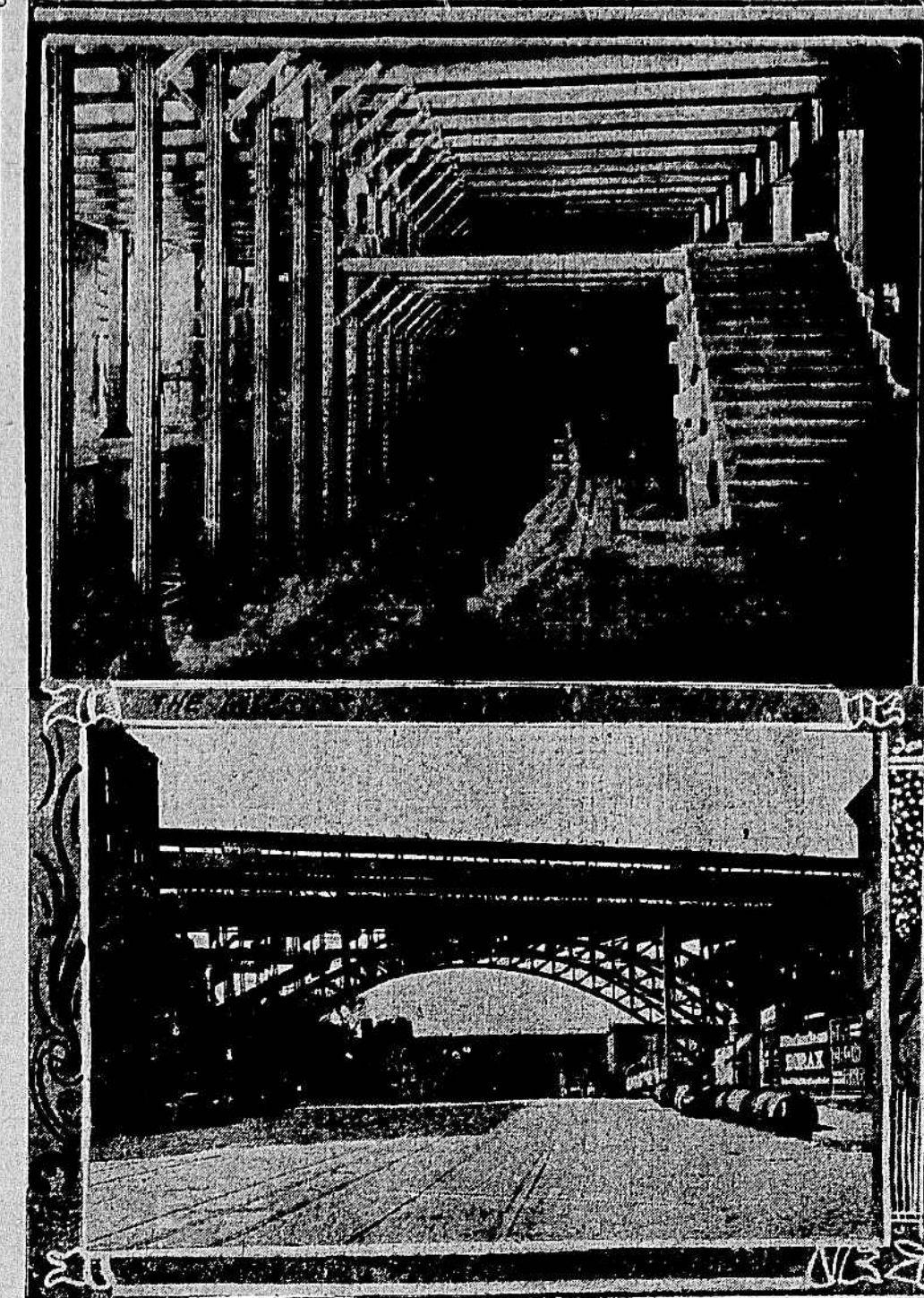
The Pyramids and the third Rameses' built monuments in their day, but they did nothing so vast as this.

"In the days of the Caesars," said a New York engineer. "Pliny tells us it took thirty thousand men eleven weary years to cut a tunnel, the size of a half-mile long. To-day, employing less than twelve thousand men, the New York masters of engineering mechanics have made a tunnel equal in capacity to one of over fifty miles in length like that of Rome. To-day, no colony of men, in miles of elevated structure and the excavation of extra areas for underground stations."

True, there are other underground roads in the world; but, compared with them, this one is as "all Lombard street to a China orange." The famous "tuppenny tube" in London, for example, only covers the distance from the Battery to Forty-second street, where the real journey to the end of the line is hardly beginning.

Its Appalling Dimensions.

It has been carefully estimated by engineers that the subway were a single tunnel six feet high and three feet wide, it would reach from New York to Chicago. The part excavated through the



solid rock would reach from the metropolis to Cleveland, and the hole—that is how one man connected with the work summed it up. While the excavations are going on, millions of feet of lumber are being used to prop up the streets so that the ordinary traffic can go on. All the engineers engaged in the enterprise are impressed by its magnitude, and cannot help stopping now and then to indulge in the wildest kind of "applied statistics." One of them says that this tunnel, even if no fewer than ten thousand two-story frame houses; while another asserts that the rock taken out by the tunnel would make a respectable imitation of the Great Wall of China, namely, a structure three feet thick, six feet high, and about five hundred miles long.

There is no doubt about it—the New York subway is the greatest thing of its kind that mankind has yet done.

Was a Big Job.

The city of New York decided to have the subway constructed by contract and leased to the contractor for fifty years for an annual rental of rather more than the interest payable by the city on the bonds issued to provide means for the construction. It is hardly credible, but it is the fact that of all the great contracting engineers in the world only two could be found to put in bids for such a vast work. They were John B. McDonald and Andrew Onderdonk.

McDonald asked for \$35,000,000 in a round sum. That was about the figure estimated by the engineer of the Rapid

Transit Commission, William Barclay Parsons. Onderdonk wanted \$23,000,000 and certain concessions. McDonald got the job, and has carried it out in a manner that has met with the enthusiastic approval of many distinguished engineers who have inspected his work.

"Rapid transit"—the elusive dream of New Yorkers for so many years—will be something more than a mere phrase when the subway is running full blast. It is provided by contract that local trains must run at an average speed of not less than fourteen miles an hour, including station stops; while express trains must make thirty miles an hour. This will easily bring people from Kingsbridge, at the northern point of Manhattan, down to the City Hall in fifteen minutes. Visitors from "out of town" will no longer be able to say, as they always do say nowadays, "Come to our city and we'll teach you how to travel."

Close to the Surface.

Unlike most underground roads, the New York subway runs close to the surface. Throughout most of the length from the Battery to Harlem, it is only four or five feet below the street level. This makes the excavation about twenty feet in depth, and the platforms of the stations are within sixteen and eighteen feet of the surface. The steps down from the street to the station are thus fewer in number, as a rule, than those up to the present elevated stations. The problem of ventilation—always a difficult one in underground railroads—is much simplified by this nearness to the

street, and the foul atmosphere that chokes the passengers in London's "tuppenny tube" need not be feared.

The largest station on the subway is the Brooklyn Bridge station, which is really the downtown terminal. Its network of tracks rivals the average terminal in a fairly large city, and a few feet above it rolls interminably the heaviest street traffic of the city, including many electric car lines. Steel beams, five feet thick, hold up the immense weight of this traffic.

From this station at the Brooklyn Bridge clear up to Thirty-third street—the hub of the universe to many New Yorkers—the subway consists of a four-track line running in a single tunnel. Two tracks are for expresses and two for locals. It is arranged that express trains will run on express tracks only, and local trains on local tracks—an excellent system, which does not now prevail on the elevated railways of New York city.

Have Double Tracks.

The road consists of two double-track tunnels above Thirty-fourth street, which pass on either side of the existing Park avenue street railway tunnel, but at a lower level. Manhattan is, indeed, becoming honeycombed in all directions, and the end of the tunneling is not yet in sight. New Yorkers are living in thirty stories and travelling in three—in tunnels, street cars, and elevated trains.

The subway follows Broadway to One Hundred and Fourth street and there divides into two lines—one on the East

Side and the other on the West Side. At two points before reaching One Hundred and Fourth street the tunnel has to pass under the elevated railway, and the task of holding up the great weight of that structure while the tunneling was going on was one of the most difficult that the engineers had to face. Downtown, they dived under a Park row newspaper office with such a small margin to spare that the ends of the presses actually projected over the tunnel, and yet were able to keep running without an hour's loss of time. Another ticklish problem was to run underneath the vault of the New York postoffice without disturbing the work going on there.

But it is not only the underground work of which the subway engineers have good reason to be proud. From One Hundred and Fourth to One Hundred and Sixteenth streets they have carried the line on a single solid concrete arch in an open cut, with a span of forty-two feet. This is technically regarded as one of the best pieces of work of its character ever done. At the end of this cut comes the long, deep dip known as Manhattan Valley, which is crossed on an immense elevated steel viaduct in order to maintain the grade of the line. From One Hundred and Fifty-fifth street to One Hundred and Nineteenth street the tunnel had to be bored entirely through solid rock, and this part of the work alone is said to be the longest double-track railroad tunnel in the United States.

Thousands at Work.

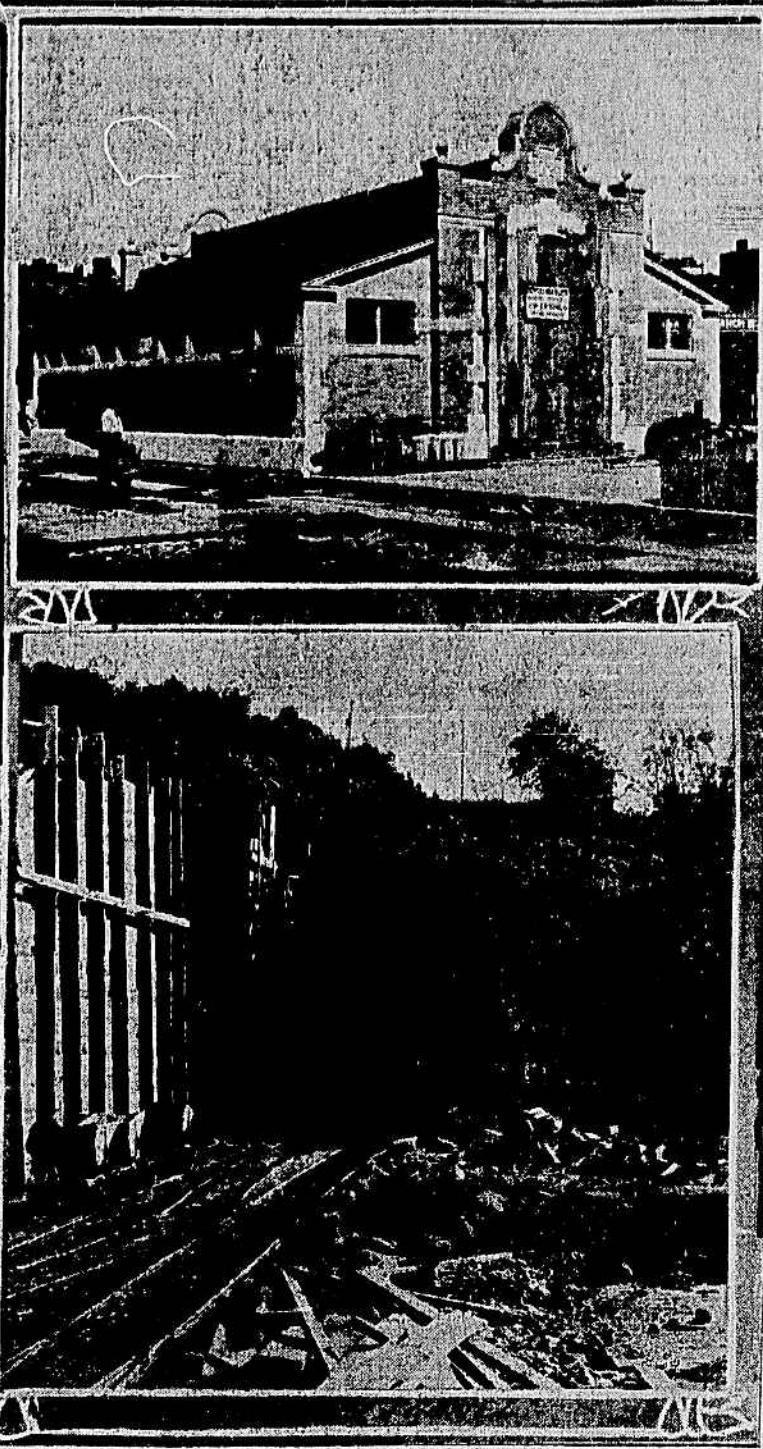
On an average the army of subway

laborers has consisted of about ten thousand men during the past four years, and the cost of excavating took up about one-third of the entire contract, price of \$55,000,000. The drilling of the rock took up the great part of the time. If it had been drilled by hand, the engineers doubt whether the work could have been done in a quarter of a century. There has been no such difficulty in any previous work of the kind. The subways of London and Paris were cut through clay, and that of Boston through earth.

Many unexpected difficulties were met with in the course of the work. One was the interference with the drainage of the city, running suddenly up against a network of sewers which seemed to effectually block the path. These were problems sufficient to turn an engineer's hair gray. In one place, merely as a little side issue of their business, the makers of the subway had to change the system of drainage of a large district, making the sewers drain into the East river instead of the Harlem river. At another place they had to tear up a network of street car tracks and relay them.

The subway will not be a dark, miserable, stuffy place, like the London Underground Railway. It is clean and white throughout, and so thoroughly lighted by electricity that it is as bright as day everywhere. The stations are, in many cases, real works of art, and all of them are convenient and comfortable.

The gigantic power-house on Fifty-eighth and Fifty-ninth streets, which



Plans Already Underway to Extend the Underground Transit in Manhattan and Brooklyn.

PROBLEM FOR ENGINEERS

Many of These Had to Be Dealt With in the Great Work—The Tracks and Stations.

vitalizes the third rail, is a structure of which the makers of the subway are justly proud. It has a frame of 29 feet on Eleventh avenue and extends westward for nearly 700 feet, while the height is 125 feet. It is thus one of the largest buildings in New York, and one of the largest power houses in the world. The weight of a steel frame of this kind is about 12,000 tons. The total generating capacity of the plant is about 130,000 horse power. The third-rail system of electrical propulsion is to be used throughout.

Now Practically Complete.

The subway is now practically completed throughout the entire length of Manhattan. It is a great work, and it must not be supposed that it has solved the vexed question of transportation in the metropolis. Engineers and traffic managers familiar with conditions in New York believe that it will be at best merely a temporary and partial relief to the present unbearable congestion of traffic. There will still, in all probability, be a vast army of "strap-hangers" on the subway itself, as well as on the elevated and surface lines. Other subways will have to be built, and plans for them are already being tentatively prepared and considered.

The Brooklyn extension runs under the East river to Jamaica street, Brooklyn. The Rapid Transit Commission has already authorized an extension of this Brooklyn road to Prospect Park, and South Brooklyn has also begun to clamor for a branch and is likely to get it.

In many parts of Greater New York the public is agitating for an extension of the original scheme of the subway. The Brooklyn extension under the East river was not a part of that original scheme, which was designed only to relieve the congestion of traffic in Manhattan and the Bronx.

Other Work Under Ground.

The railroad companies, especially the Pennsylvania, are also doing much work in New York at the present time, and are connecting their systems with the subway. The Rapid Transit Board has granted to the Pennsylvania, New Jersey and New York Railroad Company and to the Pennsylvania, New York and Long Island Railroad Company, jointly, franchises for a tunnel system passing from Weehawken, N. J., across the North river, right under Manhattan Island (along Thirty-second and Thirty-third streets), and thence into the Borough of Queens. There is to be a double tunnel under the North river. This Pennsylvania extension will cost about \$20,000,000, and will be provided with what has been described as "the most magnificent railroad depot yet conceived of." Four full-sized city blocks have been torn down to make way for it, and from this station three tunnels will extend under the East river into the Borough of Queens. The Pennsylvania will thus have a direct communication without the aid of ferries, not only with Manhattan, but with the extremities of Long Island. The big station in the center of Manhattan is to be connected with the subway and the Grand Central station.

Needs Not Yet Met.

They are doing great things in New York city to-day to bring Father Knickerbocker down to work without packing them like herrings in a barrel. But, though the dollars are being poured out by the million every month for the improvement of transportation facilities, the city is still inadequate to the need, and is likely to remain so for many years to come.

It is impossible to give any exact figures on this point of the relation of the provision to the need. Even the daily carrying capacity of the subway cannot be determined by estimate. The officials in charge of the enterprise will each give you a different guess, all of which are away up into the millions. The variation in these estimates is caused by the fact that some of them are based on the seating capacity of the cars which will be run, while others are founded on the demonstrated carrying capacity of the elevated and surface cars, with half their passengers hanging on to straps and the "trash" hours. (Copyright, 1904, by Bassett Staines.)

# THE TWENTIETH CENTURY MARKED BY NEW MOVEMENTS IN EDUCATION

President Harper, of the Chicago University, Discusses These With Mr. Carpenter for The Times-Dispatch.

(Special Correspondence to The Times-Dispatch.)

CHICAGO, October 8.—It was at the Union Club here that I, not Dr. William R. Harper, president of the University of Chicago, and chatted with him about the twentieth century college. Dr. Harper is at the head of our modern educators. He is the president of the association of American colleges and universities, an institution which within less than a dozen years has acquired an endowment of eleven million dollars, which has thousands of students from every part of the United States, and which has made itself felt in almost every part of the educational world.

A Strenuous Educator.

Dr. Harper is a type of the strenuousness of our modern times. He was only thirty-five years old when he became president of the Chicago University. He was only fourteen when he graduated from the Muskegon College, and only nineteen when he took his degree of doctor of philosophy at Yale. He was made a D. D. by Yale University in 1891, and in 1892 he was elected to the presidency of the University of Chicago. He began his work as a tutor in a Tennessee college and at twenty-three was professor of Hebrew in the Baptist Theological Seminary here. At thirty he was professor of Semitic languages at Yale, and he took the same position at Chicago when he accepted the presidency of the University.

In addition to this, Dr. Harper has been a member of the Chicago board of education, and has also written a large number of educational and classical works, including text books of Greek, Hebrew and Latin, and his expertness is especially felt in the field of the educational movements of the day.

The Twentieth Century College. My first question was as to the twentieth century college; whether it is an improvement over the colleges of the past, and whether the study of the

classics is needed to equip our young men for the business life of to-day.

Said Dr. Harper: "The twentieth century college will be much better equipped than the college of the past. It will have a better library, better facilities for physical culture, and above all better facilities for the study of science. We have now many thousand high schools which are better equipped in such particulars as the modern college of the past. The majority of our colleges and universities are in a position to make themselves stronger along these lines or it must become an academy."

"In discussing the future of the American college, however, one must sharply distinguish between the college and the university. We have now to deal with universities, something which did not exist in America thirty years ago. The college is an institution which rapidly growing universities upon the college question is very close."

The Study of the Classics.

"As to the study of the classics," continued Dr. Harper, "there is undoubtedly a reaction in America thirty years ago. It was an important factor in the preparation for business life. This reaction is only temporary. Up to the present, no better means has been provided for training the mind than the old-fashioned classical discipline. At the same time it should be noted that a serious and important change has taken place in the use of the classics. The grammar is no longer exclusively or largely taught. Much more attention is now given the literary side of classical work, and this has many advantages."

"But, Dr. Harper, cannot men get the same good out of the study of more practical things than the dead languages?"

"I do not think any other study trains the mind quite so well. However, if good methods are adopted there is no doubt but that men can be well trained by

using any of the more common fields of knowledge as a basis. For this reason a large use is made of history, political economy and social science and of the natural sciences as well as of technology."

Our Boys at Oxford.

"What do you think about sending American boys to Oxford on the scholarships furnished by Cecil Rhodes? Will they get as good an education there as at home?"

"There are many American boys who will be able to obtain great advantages by a three years' residence at Oxford," replied Dr. Harper. "I do not think it would be well to have all of our boys educated there. It would not be a good thing to have them all educated at one place, or in any one way. As to whether they are to be benefited by their Oxford course depends very largely upon themselves as individuals. It is a mistake for some boys to go to college at all, and it will probably be found that some of our young men will derive no perceptible benefits from their stay at Oxford. But if the selections are made on the proper basis, the experience of our young Americans in Oxford will prove to be not only a great factor in their education, but also one in the educational system of the United States, which will be the richer because of this new contribution."

Can Business Men Afford the Time.

"But, Dr. Harper, do we not devote too much time to education? Can the man who expects to enter commercial or business life afford to spend four years at college?"

"That depends upon two things: First upon the age at which he enters college, and second the good he is getting out of his college work. If a young man is not able to enter college until he is twenty-one or twenty-three and he cannot therefore graduate until he is twenty-five or twenty-seven, the question is a serious one for him. The average boy, however, should be able to enter college at not later than seventeen, and there is no reason why such a boy should not spend three or four years in study, whatever is to be his occupation. He will surely be all the stronger for business if he has made himself acquainted with the various subjects of money, insurance, etc., which form so large a part of the business life of to-day."



PRESIDENT W. R. HARPER.

"On the other hand," Dr. Harper continued, "there is no good reason why the present four years of high school work and the four years of college work should not be properly accomplished within less than eight years by fifty per cent. of those who attempt it. A few students can do it admirably in six years, and a majority ought to do it in seven years. It would not be wise, however, to change the standard from four years to three, because in this case all would do it in three. The better way would be to arrange the work in such a manner that those who are able to go through their college course in three years should have the privilege of doing so."

What Course to Choose.

"What course would you advise the high school boy to take whose career is not to be decided until after he leaves the high school or college?"

"If it is impossible for the student to decide before that time I should certainly advise the high school course, which includes a good preparation in Latin, mathematics and science. For the boy who cannot decide on his career until after he leaves college, I should advise the same general course, with the addition of French and German, and of history and political economy. Whatever the man's occupation, these subjects will be found directly helpful."

College Athletics.

"Are not our colleges running more to muscle than brains?" I asked. "In other words, are not athletics crowding out mental training?"

"That idea is frequently presented in the daily press. It seems absurd to anyone who knows the facts. The time now given to athletics is the time which used to be spent in rowing and perhaps in drunken excess. The average college man of to-day gives more hours to study than did the average college man of twenty-five years ago. The result of physical training and athletics has been the moral purification of the college atmosphere. It has made it in-

initely better than it was a quarter of a century ago. College presidents do not favor physical training and athletics because they are popular with the students, nor because they increase the number of students. Their business, the makers of the college, is to give the student a better moral atmosphere, less conflict between students and faculty and much better and stronger college work. Indeed, physical training is an essential element in successful college work. The defects of the body are often more harmful in the development of a young man or young woman than defects of the mind."

"But, Doctor, does it pay the college boy to make a name in athletics?"

"The college professor is seldom adequately paid," replied Dr. Harper, "and the same is true of the teachers in the public schools. When we take into account the ability required, the cost of preparation, the constant intellectual strain under which a professor or teacher works, the importance of having means for the purchase of books and travel, and the necessity of providing for old age, it is beyond question true that the salaries paid in America are sadly inadequate."

"On the other hand, it is to be remembered that these salaries are perhaps

larger than in any other country, even Germany not excepted, and also that the professor and the public school teacher have many opportunities of making a good thing out of no other profession of to-day offers larger or more flattering inducements to young men or young women of real ability. For the man or woman who has the instinct of presenting to others that which he himself has gained in the way of knowledge, there is no more enjoyable work. I am sure there is no calling in which the satisfaction of rendering service can be greater."

College Education for Poor Boys

"But is not the cost of education becoming so great, Doctor, that the poor boy cannot hope to work his way through college, as many have done in the past?"

"The cost of education has unquestionably increased," said Dr. Harper, "but it is not so great as some of our college men would have us believe. With the increase in cost there has also come the establishment of scholarships, of loan funds, of agencies for assisting the students to obtain work, and the number of people whose hearts prompt them to render such assistance is greater every year. The cost of a college education varies with the location of the college, the atmosphere around it, and especially with the circumstances of its foundation. There are colleges in which a boy may receive a full training for \$20 per annum, and there are others in which he cannot spend a year for less than \$200 or \$300. In both cases he can generally find opportunities to earn a large part, if not all, of his expenses. Our State universities of the West charge either no tuition fees or very small ones."

Suggestions for the Rich.

"We are a nation of millionaires with charitable tendencies," Dr. Harper said. "I will not suggest some fields in educational work which merit the gift of the rich."

(Continued on Eighth Page)